

REMARKS

Reconsideration and withdrawal of the rejection and the allowance of all claims now pending in the above-identified patent application (*i.e.*, Claims 20-28) are respectfully in view of the foregoing amendments and the following remarks.

At the outset, it should be recognized that the present invention, as now claimed, provides an installation and related method for recording travel and traffic situations of vehicles, in which a traffic situation is capable of being recorded using at least two detection cameras, which are to be arranged at a distance from one another on a vehicle. The detection cameras are to have detection regions that overlap, which allows for at least one reference point (R) of the surroundings and/or recognition point of at least one additional vehicle that may be triangulated (T), for example, using photogrammetry.

Following a traffic accident, by way of example, the behavior of one or more vehicles may be reconstructed using the apparatus and method of the claimed invention. By way of the three-dimensional, temporally-cycled detection, apart from the respective spatial position, the speed, the speed direction, directional changes, acceleration- and braking maneuvers, as well as intrinsic rotations of the individual vehicles about their centers of gravity, may be visible and measured in a scaled manner without the placement of a multitude of sensors on the vehicles of interest. The vehicles may also be projected into a three-dimensional picture of the surroundings for providing a virtual representation from any viewer's perspective, which may be computed and displayed.

More particularly, by the present method and apparatus, an efficient photogrammetry and mathematical-geometrical triangulation of certain important reference points can be executed and this allows for reconstruction of an entire accident scene in three dimensions, synchronized with the time flow. The following characteristics are crucial for realizing such a method and related apparatus:

- (a) The position and direction of two recording cameras (2, 3) on a vehicle (1), and their distance from each other, is stored in a memory device. The knowledge of these data allows for image processing and photogrammetry for calculating and therefore determining exactly the position of one or several potential reference points, either on another vehicle or in the surrounding vicinity. This permits calibration of the position of the recording, or detection, cameras in a coordinate system of the vehicle (or of a second or greater number of vehicles) and the depositing of these individual calibration data on the memory chip is clearly disclosed;
- (b) The synchronization of the time of the two cameras, to ensure that the pictures are being taken at simultaneously to permit a relevant comparison;
- (c) The use of an automatable photogrammetric method, instead of a manual stereoscopy, for greater precision;
- (d) A three-dimensional analysis of only a limited number of selected artificial or natural reference points. This is necessary for a clear definition of the location or position, but does not comprise the complete reconstruction of all pixelpoints of the picture, since the greatest part of these are not needed, and therefore not all objects in the pictures need to be determined;

(e) Currently three-dimensional objects, such as vehicles, are not being three-dimensionally reconstructed, but rather, such known objects are being taken as known objects from a CAD-database and only with the aid of the measured translation/rotation of the "connected" or "tied-up" reference-points in the virtual 3D-space, are these objects being moved. Merely the pure movement of a known geometrical object (based on the reference points) is being performed, rather than reconstructing of an object-geometry which is very difficult and burdensome. The movement of only three reference points must be known and with this, one can reconstruct all movements of an entire object attached to these reference points. The contour or shapes of these objects are taken from a database or databank which contains sufficient knowledge of such objects; and,

(f) The resulting film can be viewed from any desired perspective (e.g., from the bird's eye's perspective, from the perspective of the driver of the opposite traffic, etc.) and can be reduced to the object relevant for the understanding of an accident or other traffic incident and which contains all relevant data in the exact scale. Such incidents need not be estimated by a picture-pixel-correlation. Instead, an incident's entire movement is precisely calculated for providing an exact scaled 3D-reconstruction from any desired perspective, which works with the concept of photogrammetrically calibration and time-synchronized cameras.

As will be explained in greater detail hereinafter, nowhere in the prior art is such a novel and efficient method and related apparatus for evaluating travel and traffic situations with at least two temporally-synchronized and calibrated detection cameras, which utilizes photogrammetrical calculation, either disclosed or suggested.

By the present amendments, Applicant has canceled prior Claims 1-19 and has substituted therefor new Claims 20-28, of which Claim 20 is an independent method claim and Claim 23 is now Applicant's independent apparatus claim. Upon drafting new Claims 20-28, Applicant has deleted the pendency of any multiple dependent claims and has avoided use of the language objected to by the Examiner as part of the first Office Action.

New Claims 20-28, which are now drafted in a manner that more closely conforms to U.S. practice, are in condition for a full examination on their merits and, as discussed below, are respectfully submitted to be allowable over the prior art.

Turning now, in detail, to an analysis of the Examiner's prior art rejections of the first Office Action, initially, the Examiner has rejected the subject matter of original Claims 1, 2 and 16-19 as being anticipated, pursuant to 35 U.S.C. §102(b), by Kinoshita *et al.*, U.S. Patent No. 5,757,949, on the contention that Kinoshita *et al.* discloses an installation for recording travel and traffic situations of vehicles, characterized by an arrangement to be attached to a vehicle (1), of at least two detection cameras (2 CCD cameras 25) lying at a distance to one another (left side and right side of front end of vehicle), wherein their respective regions overlap in a common overlapping region (Col. 3, line 58-col. 4, line 9; figure 2), by which means at least one reference point of the surroundings and recognition point of a second vehicle (preceding vehicle), recorded by the two detection cameras (25), may be triangulated, with the purpose, from a picture recording, of reconstructing its position and by way of this the position of at least one

vehicle after a traffic situation (triangulation is used to calculate and detect obstacles, lanes and preceding vehicles) (col. 3, line 58-col. 4, line 9; figure 2), thereby anticipating that which is recited by Applicant in the enumerated claims of the anticipation rejection.

In reply to the anticipation rejection applying Kinoshita *et al.*, the presently claimed invention, in sharp contrast to, and unlike, Kinoshita *et al.*, makes use of photogrammetrial procedures which allow for a determination of exact distances, speeds and accelerations in a three-dimensional space, which can later be viewed from any desired direction or viewpoint. By the collected data of two synchronized and calibrated cameras, which are linked to a timepiece, a virtual space can be created in which the actions can be viewed in real time, giving the exact positions, speeds and accelerations of any point which was recorded. Accompanying the instant *Amendment* is an excerpt from Karl Kraus, *Photogrammetry* (at 320) (“NPL Document”), which explains the difference between mere triangulation and photogrammetry.

Further, the presently claimed method unlike the applied prior art allows for consideration of pre-stored shapes of a multitude of different vehicles to selected reference points in a recorded film. This permits the claimed invention to simulate the movement of various vehicles with only the requirement of calculating the movement of three reference points in space, which necessarily demands much less processor capacity than calculating any point of any entire vehicular shape.

In light of the foregoing, it is respectfully contended that the Examiner’s 35 U.S.C. §102(b) anticipation rejection of the first Office Action, which applies Kinoshita

et al. has been overcome and should be appropriately withdrawn.

Separately, the Examiner has rejected the subject matter of original dependent Claims 3 and 4 as being obvious, pursuant to 35 U.S.C. §103(a), over Kinoshita *et al.*, taken in view of Simon *et al.*, U.S. Patent No. 6,757,009. The Examiner has contended that the primarily-applied reference of Kinoshita *et al.* discloses all features of the claimed invention, except the triangulation procedure, which includes calculating the triangulation by using the distance between the detection cameras. The Examiner has therefore secondarily-applied Simon *et al.* in the obviousness rejection issued as part of the first Office Action, contending that Simon *et al.* discloses a triangulation method for stereoscopic cameras.

In reply to the 35 U.S.C. §103(a) obviousness rejection of the subject matter of original Claims 3 and 4, which applies Kinoshita *et al.*, taken in view of Simon *et al.*, neither of the applied references can be said to either teach or suggest the use of photogrammetrial procedures which allow for a determination of exact distances, speeds and accelerations in a three-dimensional space. In this respect, Applicant's invention differs from the prior art that relies upon the triangulation procedure.

In view of the foregoing, and to the extent relevant to Applicant's newly-entered claims, withdrawal of the Examiner's 35 U.S.C. §103(a) obviousness rejection of the first Office Action is respectfully contended to be appropriate.

Concerning, finally, the remaining references cited by the Examiner, but not

applied in any rejection of Applicant's claims, such additional references have been carefully considered, but are not deemed to adversely affect the patentability of the present invention, as now claimed.

In view of the foregoing, it is respectfully contended that all claims now pending in the above-identified patent application (*i.e.*, Claims 20-28) recite a novel and efficient method and related apparatus for evaluating travel and traffic situations with at least two temporally-synchronized and calibrated detection cameras, which utilizes photogrammetrical calculation, which is patentably distinguishable over the prior art. Accordingly,

withdrawal of the outstanding rejections and the allowance of all claims now pending are respectfully requested and earnestly solicited.

Respectfully submitted,

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Enc.: 1. Petition for Two-Month Extension of Time for Response;
2. EFT for \$245.00 (Two-Month Extension Fee); and,
3. Karl Kraus, *Photogrammetry* (at 320) ("NPL Document").

The Commissioner for Patents is hereby authorized to charge the Deposit Account of Applicant's Attorney (*Account No. 19-0450*) for any fees or costs pertaining to the prosecution of the above-identified patent application, but which have not otherwise been provided for.